

technology innovation centre

Postgraduate Programme

**Programme Specification including
Student Guide and Employer Guide**

**MSc Data Communications and
Software**

**Version 3.2
September 2005**

Validated: April 2002



NOTE: This specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes advantage of the learning opportunities that are provided. More detail on the specific learning outcomes, indicative content and the teaching, learning and assessment methods of each theme can be found (1) <http://web.tic.ac.uk> , (2) in the Theme Specification Handbook, and (3) in the Student Handbook. The accuracy of the information contained in this document is reviewed by the University and may be checked within independent review processes undertaken by the Quality Assurance Agency.

The information from this specification may be selectively extracted and included in documents that are more appropriate for students, intending students and employers.

1 Awarding Institution / Body:	University of Central England
2 Teaching Institution:	Technology Innovation Centre
3 Programme accredited by:	N/A
4 Final Award:	MSc
5 Programme Title:	Data Communications and Software
6 UCAS Code:	N/A
7 QAA Benchmarking Group:	N/A

8 Aims of the programme

The programme aims to provide learners with the ability to:

- Complete a course of study that will extend them intellectually and practically according to their abilities.
- Demonstrate the knowledge and skills to develop complex software systems to meet the market need for software professionals in the changing environment.
- Encourage the development of multidisciplinary approaches to the development of embedded systems, communication systems and software.
- Undertake a range of challenging engineering projects within the constraints and demands of an industrial environment.
- Work on industry standard devices, software and hardware.
- Gain internationally recognised certifications, putting them at an advantage in the jobs market.

9 Intended learning outcomes and the means by which they are achieved and demonstrated: the programme provides learners with opportunities to develop and demonstrate knowledge and understanding, skills and other attributes as follows:

Knowledge and understanding

<p>Knowledge and understanding of:</p> <p>Design of Communications Systems The theme will develop the student's skills in designing and implementing communication systems to a given specification. It aims to extend knowledge and techniques for the design, configuration and deployment of networking devices, routers and switches, within both Local Area Networks (LANs) and Wide Area Networks (WANs) which are typically found at medium to large network sites.</p> <p>Management of Network Services This theme is concerned with the application of the concepts of network management and security to commercially expanding networks and network services.</p> <p>Network Diagnostics and Implementation This theme is a recommended option and will provide students with the knowledge and hands-on experience in troubleshooting sub-optimal performance in a converged network and is an integral part of any approach to obtain the technical proficiency and knowledge of a network professional. The theme will also allow the student to understand the relationship between troubleshooting and the management of the network.</p>	<p>Teaching, learning and assessment methods used: Knowledge and understanding are acquired through course material, electronic and face-to-face communication, seminars, student-led seminars and other directed independent learning activities at all stages.</p> <p>Knowledge is assessed, formatively and summatively, by a number of methods, including seminars, coursework, presentations, and practical project work.</p> <p>A range of assessment methods are employed, the criteria for each theme being published within each specified theme guide.</p>
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Skills and other attributes

Intellectual / cognitive skills:

- Analysis of customer related issues and the ability to design and implement solutions based on user requirements and specification.
- Argue rationally and draw independent conclusions based on a rigorous, analytical and critical approach to demonstration and argument.
- Synthesise theory and practice to design/implement a range of solutions
- Assess and resolve competing issues such and resources.
- Construct a fully researched and referenced technical reports, which evaluate both technical and management issue. This will involve the use of a variety of IT tools.
- Demonstrate, in an analysis of a specified problem, a high level of competence and understanding of the data manipulation and information presentation and delivery.
- Relate to industry and commerce and apply new technologies and techniques to solve present and future problems concerning not only UK but also international companies.

Teaching, learning and assessment methods used:

Intellectual skills are developed through teaching and learning which is assessed by using real engineering problems and or case studies to develop the ideas presented in the formal taught part of the course.

Analytical and problem solving skills are further developed using a range of appropriate 'real' and 'theoretical' case studies and problem and task-based learning scenarios.

Many of the themes require a major project report to be produced which demonstrates the student's ability to apply the knowledge gained to the solution to an industrial problem.

Assessment includes practical project work, individual and group presentations, written coursework.

Practical, research and independent learning skills:

- Access information from the Internet and appraise its suitability for research purposes at a Master's level. To demonstrate the ability to work autonomously and accept accountability.
- Reflect on personal practice and modify it accordingly.
- Interpret and critically evaluate knowledge, concepts and ideas and/or forms of artistic expression.
- Comprehend and solve mathematical problems at a level required by the chosen course of study.
- Demonstrate the knowledge and skills outlined within Learning Outcomes. Apply the knowledge, skills and methodologies of the discipline(s) or field(s) of study to the analysis and solution of complex problems or to the expression of sophisticated artistic ideas.
- Possess a defined body of knowledge, skills and understanding and analyse its relationships with conceptual frameworks and, where appropriate, professional practice.
- Comprehend and solve mathematical or analytical problems at a level required by the chosen course of study.
- Demonstrate the knowledge and skills outlined within the Networking and Software toolkit session.

Teaching, learning and assessment methods used:

The acquisition of appropriate and transferable practical skills is central to the learning strategy of the programme. Initiative and independence are fostered throughout, and develop incrementally as the course progresses. Emphasis is placed on guided, self-directed and student-centred learning, with increasing independence of approach, thought and process.

Learners are encouraged to plan their own work schedules and are required to meet strict deadlines. Diaries / logbooks are required to be kept in some modules. Learners undertake a major individual practical / research project and complete a related dissertation.

The Postgraduate Study Development Unit (PSDU) provides the vehicle for the development of research and learning skills. The PSDU, which is of 120-hours duration consists of three elements:

- **Learning Review** - When a student commences a course of study the Postgraduate Study Development Unit will allow students to identify themes they will undertake and the personal learning outcomes they expect to achieve from the study.
- **Research & Learning Skills Development** – The PSDU will provide the student with a mechanism to develop their skills to take full advantage of the flexible delivery of the course. Workshops and web-based sessions will cover Report Writing, Presentation Skills, Research Methodology, IT and Internet

skills.

- **Networking and Software Toolkit** - Introduction to software environments and programming skills. Networking: routing, switching and LAN/WAN design, implementation and test.

PSDU assessment includes the preparation of a formal written report, an oral presentation and the production of an electronic presentation. The initial submission of the Learning Review also contributes to the assessment.

<p>Transferable / key skills:</p> <ul style="list-style-type: none"> • elicit the co-operation of others and contribute to team goals • manage time and prioritise workloads • make effective oral and written presentations which are coherent and comprehensible to others • access and make appropriate use of relevant numerical and statistical information • use a variety of forms of communication and expression and employ them selectively, appropriately and effectively according to the needs of a situation. • plan and deliver an oral presentation in an eloquent and professional manner, making use of a computer-based presentation aid and to lead discussion and field arguments. • understand career opportunities and begin to plan a career path. • show confidence and self-awareness, reflect on own learning, and be self-reliant and constructively self-critical. 	<p>Teaching, learning and assessment methods used:</p> <p>Transferable/key skills are core to the learning strategy of the programme. They are pervasive, and are incorporated into themes and assessments as appropriate, for example, team-working skills are fostered through the use of group, task-based practical projects. Keeping logbooks and submitting self-assessment documentation in support of personal performance fosters reflection and self-awareness.</p> <p>The use of information technology plays an active role throughout the course.</p> <p>Assessment methods include practical projects, presentations, coursework, peer- and self-assessment.</p>
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10 Programme structure and requirements, levels, themes, credits and awards

The MSc programme is normally studied over one year full-time or two years part-time, and students may if they wish move between full- and part-time modes of attendance. The academic year is divided into semesters of approximately 15 weeks each, which run from September to January and January to June. The course is divided into 6 distinct study units, a Postgraduate Study Development Unit (12 Credits at level 7), four themes, (27 credits) and a Master's project (60 credits). Students complete 66 credits at the Postgraduate Certificate stage, 120 credits at the Postgraduate Diploma stage and 180 credits at the MSc stage. Each credit represents 10 hours of student learning and assessment.

The structure of the course, the theme, levels and credit ratings and the awards that can be gained are shown below. Personal Development Planning is an integral part of the learning process of all themes.

Stage 1

Theme Name	Credit
Postgraduate Study Development Unit	12
<p>Learning Review- The Postgraduate Learning Review will be started during the Postgraduate Study Development Unit and completed during the course.</p> <p>Learning, Research and ICT skills development- Report writing skills, Information skills, IT skills, Basic mathematical / statistical skills, Oral presentation, Time management, CV preparation</p> <p>Systems Requirements Engineering Toolkit- Requirements capture, technical feasibility, economic feasibility: life-cycle costing, evaluation of benefits, discounted cash flow forecasting, cost-benefit analysis, budgeting and system specification</p>	
Design of Communications Systems I	27
Network Design Concepts Advanced Routing Concepts WAN Technologies	
Optional Theme from:	27
<p>Management of Network Services Systems Management, Network Security Techniques, Network Design & Modelling.</p>	
<p>Analysis and design of a real-time software system Software Engineering for Real-Time Systems Embedded Systems Engineering Managing the Software Process</p>	

Object-oriented System Development

Database Analysis and Design
 Object-oriented Analysis and Design
 Further Object-oriented Programming (C++ / Java)

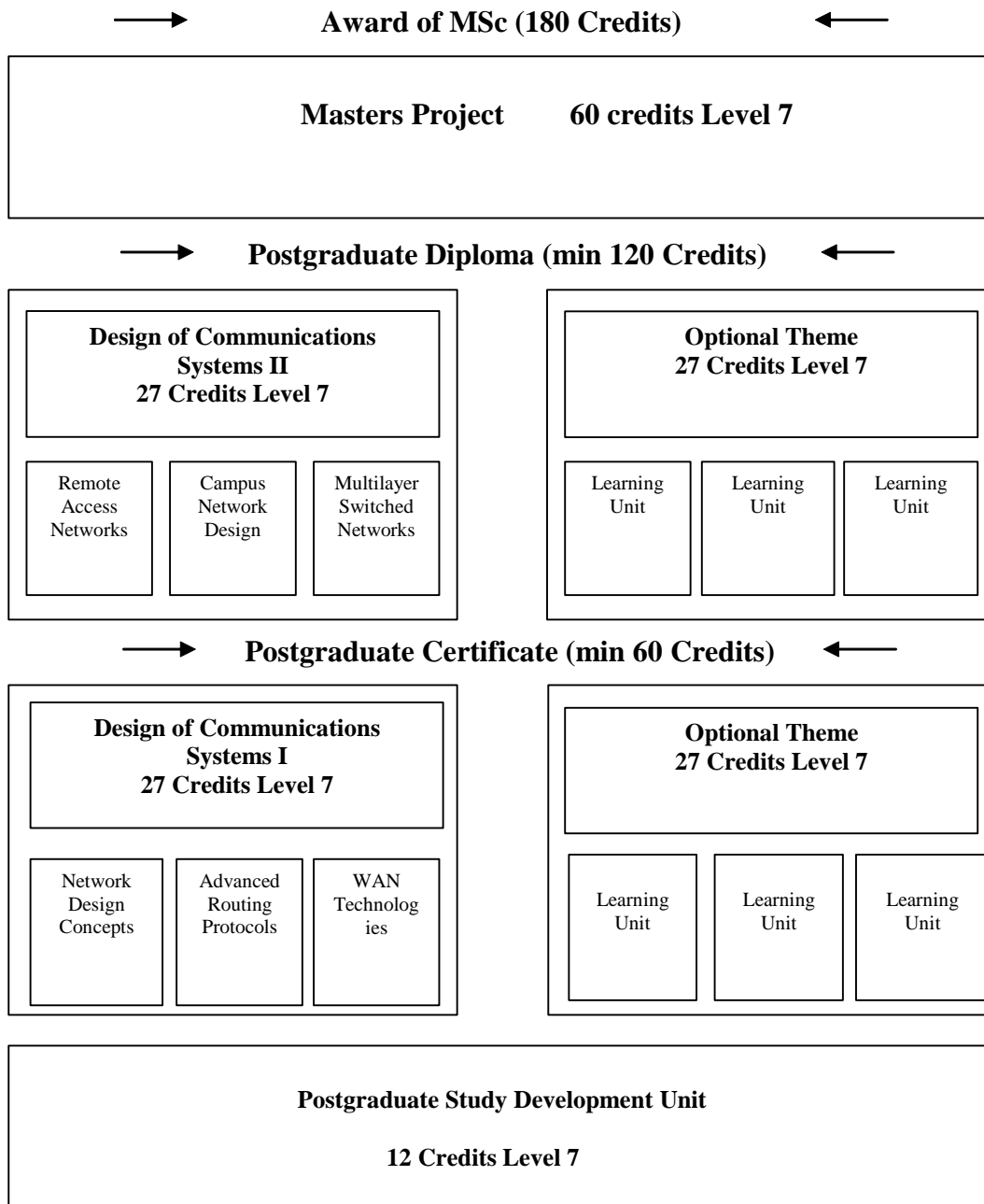
Award: Postgraduate Certificate (66 credits)**Stage 2**

Theme Name	Credits
Design of Communications Systems II	27
Remote Access Networks, Campus Network Design, Multilayer Switched Networks.	27
Optional theme Students may select an option from the Software Technology course or a specialist Networking and Data Communications option.	
Network Diagnostics and Troubleshooting Network Management and Diagnostic Tools, Network Diagnostics Methodologies for Lower Layers, Network Diagnostics Methodologies for Upper Layers.	
Software Implementation and Testing Advanced Programming for Data Structures and Algorithms Programming for Graphical User Interfaces Software Verification and Validation	
Advanced Systems Application Advanced Operating Systems Advanced Programming Concepts Programming for Networks	

Award: Postgraduate Diploma (120 credits)**Stage 3**

Element Name	Credit
Master's Project -	60
The project is the ultimate test of the student's ability to integrate and synthesise what has been learnt on the course. It provides an opportunity to apply knowledge gained to a substantial industrial problem	

Award: MSc (180 credits)



Structure diagram for the MSc in Data Communications and Software

11 Support for Learning

Students are encouraged to identify and, with guidance, to reflect on their own learning needs and are offered the following support as appropriate to those needs:

A 120 hours PSDU, that includes an intensive review and assessment of the fundamental requirements of the study units.

A dedicated Learning Centre with open access learning materials, resources and full-time staff specialising in a variety of support areas.

A Student Handbook, containing information relating to the University, Faculty, course and modules.

Access to administrative staff and to academic staff, including the Stage Tutors, Course Director and Head of School, at reasonable times;

Support staff to advise on pastoral and academic issues, and to offer support and assistance with the keeping of Students' Progress Files;

Access to Faculty resources, including the Faculty Resource Centre, and a range of supported IT equipment.

Access to the services of the Faculty librarian

Access to the University's Student Services, including those offered by the careers service, financial advisers, medical centre, disability service, crèche, counselling service and chaplaincy.

12 Criteria for admission

Candidates must satisfy the general admissions requirements of the programme, which are as follows:

Minimum 2(ii) Honours degree from a UK University or equivalent in a relevant subject.

Alternative Entry Routes

Students who do not hold the standard entry requirements may be considered for admission provided they can satisfy the Course Director and relevant Theme tutors that their qualifications and/or industrial experience are equivalent to that attained through the completion of an appropriate honours degree programme.

13 Evaluation and improvement of quality and standards

Committees: Industrial Steering Panel Meetings Course Committee Board of Studies Examination Board Learning Management Committee (LMC) Faculty Board Academic Quality and Support	Mechanisms for review and evaluation: Review and validation events Annual Monitoring Report Student feedback questionnaires Annual staff appraisal External Examiners' Reports Course team meetings Course team annual Away Day
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14 Regulation of assessment

Details of the mechanisms and criteria for assessment in individual modules, and the means of determining final degree classifications, are published widely. Students are issued with copies of the University's Standard Postgraduate Assessment Regulations on commencing the course, and individual and collective guidance is given by academic staff on their operation at appropriate times throughout the course. During 2001/2002 the Standard Postgraduate Assessment Regulations were reviewed to ensure compatibility with the National Qualifications Framework.

To qualify for a **Postgraduate Certificate** a student must successfully complete all required assessments and obtain a minimum of 60 credits of which at least 30 must be at Level 7. The pass-mark in all modules is 40%

The award of Postgraduate Certificate is not differentiated.

To qualify for a **Postgraduate Diploma** a student must successfully complete all required assessments and obtain a minimum of 120 credits of which at least 90 must be at Level 7. The pass-mark in all modules is 40%.

The award of Postgraduate Diploma with Commendation is made to students who achieve an average mark of 60% at the first sitting in the marks awarded for Stage 2 modules equivalent to at least 60 credits.

The award of Postgraduate Diploma with Distinction is made to students who achieve an average mark of 70% at the first sitting in the marks awarded for Stage 2 modules equivalent to at least 60 credits.

To qualify for a **Master's Degree** a student must successfully complete all required assessments and obtain a minimum of 180 credits of which at least 150 must be at Level 7. The pass-mark in all modules is 40%.

The award of Masters Degree with Commendation is made to students who achieve an average mark of 60% at the first sitting in the marks awarded for Stage 3 modules equivalent to at least 60 credits.

The award of Masters Degree with Distinction is made to students who achieve an average mark of 70% at the first sitting in the marks awarded for Stage 3 modules equivalent to at least 60 credits.

External Examiners are appointed. Their work includes:

- approving coursework assignments and assessment criteria
- approving examination papers
- monitoring standards through moderation of completed assessments
- attending Examination Boards
- participating in the review and validation processes.

Student Guide

Background

The UK communications industry is one of the largest established in the world, influencing all business sectors. Open communications have encouraged innovations and competitive products and services. To stay ahead, companies need to be aware of the latest technologies, the latest products and services and how to utilise them.

Modern networking practitioners require a broad range of skills and knowledge, even if they choose to specialise. An appreciation of system design and management is essential to maintain a high-level perspective of a complex system along with detailed methodologies in specification, analysis, implementation and testing. This advanced course in Data Communications and Software is aimed at professional or experienced network technologists, or software engineers who wish to update their skills in Data Communications and Networking with an element of Software Technology to compliment their career development plans and aspirations.

This is a closely related course to Data Communications and has been designed for those individuals who express an interest and show an aptitude for a combined course in Data Communications and Software Technology.

What does the industry want?

The pathway reflects increasing use by industry of complex communication and software systems, it will provide you with an insight of how they are designed, developed and enhanced in order to provide competitive advantage and gain market share.

Industry requires professionals who are able to take a multidisciplinary approach to system design, implementation, test and management.

What type of work will I do?

The Data Communications course offers the following themes:

- Postgraduate Study development Unit
- Design of Communication Systems I – Network Design Concepts, Advanced Routing Protocols, WAN Technologies.
- Design of Communication Systems II – Remote Access, Campus Network Design, Multilayer Switched Networks.
- 2 Optional themes - Students may select an option from the Software Technology course or a specialist Networking and Data Communications option.

Options include:

- Management of Network Services- Systems Management, Network Security Techniques, Network Design and Modelling
- Network Implementation and Diagnostics- Network Diagnostics for Lower Layers, Network Diagnostics for Upper Layers, Network Management and Diagnostic Tools.
- Software Implementation and Testing - Advanced Programming for Data Structures and Algorithms, Programming for Graphical User Interfaces, Software Verification and Validation.
- Advanced Systems Application - Advanced Operating Systems, Advanced Programming Concepts, Programming for Networks.
- Master's Project

You will experience a wide variety of subjects and many different types of learning environment including lectures, tutorials, and computer simulation. The course incorporates a significant amount of mini project work to provide you with an opportunity to develop and apply your knowledge.

Who will teach me?

The course team is at the Technology Innovation Centre, at the University of Central England. In addition, external industrialists are used to provide guest lectures/seminars, offering more substantial support across entire modules and complementing existing academics.

Am I just going to be taught from a Classroom?

No. Purpose built Communications, Network and Software labs, boasting high-technology facilities, are available for you.

What are my employment prospects?

The Master of Science degree in Data Communications will provide you with the expertise and knowledge required for the specification, design, implementation and management of complex systems.

The study of current methodologies and practices within the context of practical case-studies and projects will give you the confidence to tackle a wide range of multidisciplinary problems within the Communications and Networks industry. It will develop and enhance existing skills, and introduce new ones. The course fills a particular need for students requiring advanced study in a wide range of modern techniques for Communications and Networks systems, within a flexible learning environment.

Typical routes of employment that could lead from this programme includes:

- Network Designers.
- Network Performance Management.
- Network Security, Simulation and Management.

- Research associate at PhD level.
- Teaching Company Associate.

How do I apply?

University Faculty: Technology Innovation Centre
Course Length: 1 year full-time and normally 2 years part-time
Location: Millennium Point, Curzon Street, Birmingham B4 7XG
Enquiries: Information Officer (at the above address) or at
enquiries@tic.ac.uk or Telephone: (+44) (0)121 331 5400

Employers Guide

Introduction

The UK communications industry is one of the largest established in the world, influencing all business sectors. Open communications have encouraged innovations and competitive products and services. To stay ahead, companies need to be aware of the latest technologies, the latest products and services and how to utilise them.

Modern networking practitioners require a broad range of skills and knowledge, even if they choose to specialise. An appreciation of system design and management is essential to maintain a high-level perspective of a complex system along with detailed methodologies in specification, analysis, implementation and testing. This advanced course in Data Communications and Software is aimed at professional or experienced network technologists, or software engineers who wish to update their skills in Data Communications and Networking with an element of Software Technology to compliment their career development plans and aspirations.

Facilities / Partnerships

Students following the programme have access to state-of-the-art facilities at the Technology Innovation Centre (tic). The course is based within the Technology Innovation Centre, which is a part of the University of Central England. The Technology Innovation Centre is located within Birmingham's prestigious Millennium Point building, a £114m development providing some of the best resources and facilities in the country and the cornerstone of Birmingham's Eastside Learning Zone. The tic has a close partnership with CISCO systems. The tic has Super CATC (CISCO Authorised Training Centre) status and provides training for network professionals throughout the EMEA (Europe, Middle East and Africa) region.

Programme Aims

To provide a course of study that develops the student intellectually and creatively by combining knowledge and skills in the use of complex software systems to meet the market need for communication professionals in the changing environment.

The Curriculum

The Data Communications and Software course offers the following themes:

- Postgraduate Study development Unit
- Design of Communication Systems I – Network Design Concepts, Advanced Routing Protocols, WAN Technologies.
- Design of Communication Systems II – Remote Access, Campus Network Design, Multilayer Switched Networks.

- Optional theme - Students may select an option from the Software Technology course or a specialist Networking and Data Communications option.

Options include:

- Management of Network Services- Systems Management, Network Security Techniques, Network Design and Modelling.
- Network Implementation and Diagnostics- Network Diagnostics for Lower Layers, Network Diagnostics for Upper Layers, Network Management and Diagnostic Tools.
- Software Implementation and Testing - Advanced Programming for Data Structures and Algorithms, Programming for Graphical User Interfaces, Software Verification and Validation.
- Advanced Systems Application - Advanced Operating Systems, Advanced Programming Concepts, Programming for Networks.
- Master's Project

Expected Outcomes

Postgraduates can be expected to have acquired extensive knowledge and hands-on practical experience of analytical skills, communication system design implementation and management.

Specifically they will be able to:

- Analyse customer related issues and design and implement solutions based on user requirements and specification.
- Argue rationally and draw independent conclusions based on a rigorous, analytical and critical approach to demonstration and argument.
- Synthesise theory and practice to design/implement a range of solutions whilst assessing and resolving competing issues such as resources.
- Construct a fully researched and referenced technical reports, which evaluate both technical and management issue. This will involve the use of a variety of IT tools.
- Demonstrate, in an analysis of a specified problem, a high level of competence and understanding of the data manipulation and information presentation and delivery.

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- Relate to industry and commerce and apply new technologies and techniques to solve present and future problems concerning not only UK but also international companies.
- Skills required to work as an effective team member or plan, undertake and present an individual research and development project.

Contact Details

University Faculty: Technology Innovation Centre
Course Length: 1 year full-time and normally 2 years part-time
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